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ABSTRACT

A three-year, in-house engineering course offered to selected General Electric Company engineers is discussed. It is designed to develop the ability to identify and solve real engineering problems. The course may be taken concurrently with college courses in a cooperative program that can result in a graduate degree in engineering. (MLH)

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THE GENERAL ELECTRIC ADVANCED COURSE IN ENGINEERING

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THE GENERAL ELECTRIC ADVANCED COURSE IN ENGINEERING

Abstract

For fifty-two years the in-house Advanced Course or "ABC" Course has been generating engineering leaders for GE. The three-year program was designed to bridge the gap between college and industry, and emphasizes the solution of real engineering problems. Recently the teaching job has been shared by nine universities, who have granted 277 masters and 51 doctoral degrees to program graduates.

History

The Advanced Course in Engineering was founded in 1923 by Robert E. Doherty, whom some of you may remember as the president of Carnegie Tech, after he left General Electric. Mr. Francis C. Pratt, then vice president in charge of engineering, had observed that "a noticeable number of our most accomplished theoretical engineers and laboratorians have either pursued post-graduate studies at European universities or else have had all of their scholastic training abroad, and the time is approaching when their successors will have to be found." Doherty's own experience confirmed Pratt's observation. He said, "When I graduated, I had a burning desire to become a good engineer. But although I had passed creditably my work at college, I was still in a haze about much of the scientific and other theory I was supposed to have mastered. I found that I was not alone; most of my associates on Test, who came from colleges throughout the country, were in about the same fix. So

I undertook to do something about my own case. I studied. Further, I went to see Steinmetz and told him my predicament."

From Steinmetz, Doherty learned that his problem was not a lack of book knowledge and formulas. "Time after time," he admitted, "I went through the experience of having him point out to me something I already knew but had not learned how to use." Several years of this experience helped Doherty to form two strong convictions, which he urged upon Mr. Pratt. The first was that notwithstanding Mr. Pratt's observation about the background of many of the Company's engineers, we did not have to go to Europe for either men or education. We had good minds among the graduates of American engineering colleges who came to the Company, and we could select the best of them, fill out their deficiencies in both knowledge and understanding, and help them learn how to apply what they know. Doherty's second conviction was that "the engineering strength of the Company would be immensely increased if instead of having a few central oracles from whom troubled engineers might seek light, the Company had well-trained, resourceful minds located in all of the engineering departments." And so, to replace the oracles, and with the encouragement of Mr. Pratt, Doherty laid out the first Advanced Course Engineering, recruited a class of bright young General Electric engirs, and began. The first slide shows the 25 who completed the first year. You may recognize Doherty, and Loyal V. Bewley, who was the Dean of Engineering at Lehigh for many years.

Operation

The Advanced Course has survived and prospered during the ensuing 52 years. The next slide shows one of the 1975 first-year classes. As you can see, the differences between the students in 52 years are only superficial. The course too has remained substantially the same in spirit. Its purposes are still to develop

1. the ability to identify and solve real engineering problems,
2. concern for the readers of engineering reports,
3. generalists with competence in a wide variety of engineering fields,
4. an understanding of the use and misuse of mathematical analysis, and other ways of solving engineering problems, and
5. the realization that the engineer's primary purpose is not mathematical virtuosity, but the improvement of methods and products.

We attempt to fulfill these purposes by providing an industrial, real-world environment, and giving the students a realistic engineering problem to solve each week. The next slides show four examples: the contact pressure in a lever switch, motor-speed control with a phase-lock loop, vibration isolation for a drop forge, and the performance of a speedometer. The class lecture each week covers the technology and mathematics needed to solve the problem. The homework consists of writing an engineering report in which the student includes the analysis, an abstract, and a discussion of the results.

For the first 40 years, the Advanced Course was an in-house program of three academic years, called the A, B, and C Courses, during which the students solved about 100 problems like the examples above. Those completing the program received the coveted C-Course certificate that carries great prestige within the Company, but was little known outside except to former General Electric people. In the early 1960's the importance of graduate degrees increased noticeably. In order to continue to attract bright young engineers, we made cooperative arrangements with engineering colleges, so that the student could earn a master's degree or even a Ph.D., in addition to his C-Course certificate. We started in 1963 with the Polytechnic Institute of Brooklyn, and then developed similar programs with Rensselaer Polytechnic Institute, the University of California at Berkeley, the University of Cincinnati, Northeastern University, the University of Vermont, Syracuse University, the University of Pennsylvania, and Arizona State University. The details of these cooperative educational programs vary, depending upon the history of the relationship of the college and the local GE plant, the current attitude of the faculty toward off-campus graduate programs, and the statesmanship of the planning committees.

Students are selected for the Advanced Course on the basis of a good college record in electrical or mechanical engineering or related field, the manager's recommendation, and usually an interview. At some of the locations the Advanced Course is a part of the recruiting package for new hires, along with a program of rotating job assignments.

Classes meet on Company time, and all expenses are paid by the Company. The first year or A-Course is taught primarily by General Electric engineers. The classes meet usually one morning a week, and the homework requires about 20 hours of the students' own time. The A-Course covers a wide variety of engineering topics, places the traditional emphasis on the solution of realistic engineering problems, and receives graduate credit toward a master's degree at the local university. The B and C courses are a mixture of college courses and GE problem-solving courses. The latter become specialized in the technology of the local GE plant. Generally in three years, the students earn a master's degree and a C-Course certificate. In the last decade, since the co-operative college programs began, 277 have received master's degrees, and 51 have gone on to earn Ph.D.'s. And in the 52 years of the Advanced Course, 1434 have become C-Course graduates.

The Advanced Course is currently offered at nine GE locations:

Burlington, Vt.	Schenectady, N. Y.
Evendale, Ohio	Syracuse, N. Y.
Lynn, Mass.	Utica, N. Y.
Pittsfield, Mass.	Valley Forge, Pa.
San Jose, Cal.	

Benefits of the Program

The 1434 C-Course graduates enjoy a good reputation in the Company. Managers like them because they can

1. carry a heavier workload than the average engineer

2. solve problems in a variety of fields

3. get reasonable answers in a reasonable time, and

4. write good engineering reports.

The demand for C-Course graduates continues, even in times of recession. Many become high-level consultants and managers, and a few become famous. Perhaps you have heard of Simon Ramo, or the developer of the root-locus method, Walter Evans, or the 1973 Nobel Prize winner, Ivar Giaever. Robert E. Doherty's convictions are still being implemented. We have good minds among the graduates of American engineering colleges who come to the Company, and we help them learn how to apply what they know. Steinmetz and the other oracles are gone, and have been replaced by a steady stream of well-trained, resourceful minds in all of the engineering departments.

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